Innovations in geriatric trauma and resident research education: bridging the gap

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Abstract The recent history of changes in the geriatric population in the US, the unique vulnerability to different mechanisms of trauma and the need for innovative management strategies to address them are discussed using the Geriatric “G-60” service as an illustration. The issue is not whether geriatric trauma “G-60” is coming; G-60 is here. A short detour into my own research experience is presented not as prescription but guidance for the development of futures cadres of surgeons. Resident research is not a luxury but key to transforming knowledge from benchside to bedside and back.

It is an honor to stand before you to deliver the Thomas G. Orr Lecture, and I would like to thank the president of Southwestern Surgical Congress, David Antonenko, M.D., Ph.D., for this opportunity.

First, I would like to discuss the need for a geriatric trauma service, what I have called “G-60,” and its importance to the future of trauma surgery as well as acute care general surgery. Second, I would like to discuss another issue looming in front of all of us. The more I considered what to share, the more I’ve been convinced it is a very important one. Of genuine concern to me, personally and professionally, is the current progress of surgery and the future of surgical resident research. I believe that the survival of organizations like the Southwestern Surgical Congress depends on surgical resident research. The history of this organization is laudable, but we must look to the future. I will start with my present geriatric trauma “G-60” involvement, then take a short detour into my own past experience of surgical history making, next I will discuss resident research education, and finally tie them all together.

Geriatric trauma “G-60”

In recent years, the United States has seen a marked increase in its elderly population. The current average life expectancy is about 78 years to 75 years for men and 81 years for women—compared to only about 50 years in 1900. As life expectancy increases, there is a corresponding increase in the proportion of elderly people. Since the year 2000, the elderly population 65 years and older in Arizona has had one of the largest percentage increase in population
in the country.¹ This unprecedented increase has been projected to continue until the year 2020.

The Department of Health and Human Services in 2010 predicted that individuals aged 65 years and older constitute one of the fastest growing age groups in the US. Between 2010 and 2020, there is expected to be a 38% increase—40 to 55 million people—in this age bracket. The increase is still seen in the age group 85 and older as well.² This remarkable upsurge in the elderly population translates into increasing unmet health care needs for the elderly, not the least of which is geriatric trauma. For all those who provide trauma care, this means an increase in our elderly trauma patients, who need your care.

Healthy People 2020, which is a national health promotion and disease prevention initiative, showed that the trauma death rate per 100,000 individuals in 2009 was 56.3 for all ages. The trauma death rate per 100,000 for persons aged 65 years and older was 113.2, which is more than double.³ In 2007, the CDC [Centers for Disease Control and Prevention] noted that injury and violence are serious threats to the health and well-being of Americans ages 65 and older. Among older adults, falls are the leading cause of trauma deaths, and are also the most common cause of nonfatal injuries and hospital admissions for trauma.

The fact is, trauma is the 9th leading cause of death in individuals aged 65 years or older (CDC, 2010). Multiple studies have also shown that morbidity and mortality after trauma is strongly correlated with increasing age.

When Dr. Dzandu and I looked at the mechanism of trauma deaths at our institution, John C. Lincoln Health Network, for the last 5 years, we found that among patients aged less than 60 years, gunshot wounds were the number one cause of death, followed by MVC [motor vehicle collision]. However, when we looked at the elderly greater than 60, falls were the number one causes of death, followed by MVC.

Thus, elderly trauma patients present a large and challenging clinical problem due to conditions that compromise the body’s ability to adequately heal from traumatic injury. The pathology of aging puts elderly patients at higher risk. Preexisting chronic conditions (eg, hypertension, diabetes, COPD [chronic obstructive pulmonary disease], congestive heart failure, etc) associated with decrease in physiologic reserve, prior operations, and multiple medications, particularly anticoagulants, put them at higher risk. Seniors also experience different patterns of injury than those found in younger individuals and so must be considered differently. The elderly too frequently also suffer from domestic abuse, neglect, and self-inflicted injury, which we may not often think of and therefore not often consider.⁵

Some may wonder why we identify age 60 as the age baseline for geriatric trauma and not 65. We argue, first of all, that age 65 is a government number used for governmental decisions (ie, Social Security, retirement benefits, etc). Thus, age 65 is estimated and used by the Committee on Economic Security and may be even arbitrary. In fact, retirement can even start at age 62. We chose age 60 by serendipity.

In 2008, we thought of activating trauma strictly based on a patient’s age. This was as a result of worsening outcomes with older trauma patients. Dr Manuel Lorenzo, my former partner, and our trauma team asked the following questions: Should patients older than 60 years with polytrauma and/or significant mechanism of injury be considered as meeting the criteria for trauma team activation? Why should patients age greater than 60 with minor Injury Severity Scores (ISS 0–9) not be considered for trauma response? Would these patients benefit from a higher level of activation?

We queried the National Trauma Data Bank for the period of January 1, 1999, to December 31, 2008, for all trauma patients and their associated Injury Severity Score. Data abstracted was based on the patients’ age and ISS. The data revealed the following: the morbidity rate among patients 60 years and older was 3.3 times the rate for patients younger than 60, even for minor ISS categories (0–9). Similarly, the morbidity rate among patients 60 years and older was 2.2 times the rate for patients younger than 60, even for major ISS categories (10–15). This differential in morbidity rate diminished to only 1.5 when ISS was severe (16–24) and disappeared completely among these age groups when trauma was critical (ISS score greater than 25).

We drew the following conclusions from this study: (1) a relation exists between increased age, associated preexisting medical conditions, and a poor physiologic reserve, with resultant poorer outcomes; (2) it is essential to not undertake the elderly patient with minor or major ISS; (3) a high index of suspicion is imperative with the elderly trauma patient.⁵

As a consequence of this study,⁵ we formulated the following working hypothesis: patient age greater than 60 is an independent predictor variable with interactions, preexisting comorbidities, and poor physiologic reserve, which together are determinants for increased morbidity and mortality among geriatric trauma patients.

Thus, we felt strongly that the care given to our elderly trauma patients should be distinct from care given to younger trauma patients with the same injuries. During this same time period, we noticed an increase of geriatric trauma patients with multiple medical problems and an isolated injury, and no dedicated team was willing to accept responsibility for their care. In many trauma systems, this results in disagreement between the hospitalists, orthopedic surgeons, and trauma surgeons as to who would assume overall care of these patients.

In an effort to solve these problems, we organized a geriatric trauma service, led by trauma surgeons, which was specifically designed to expedite the care of geriatric patients through a multidisciplinary approach and to systematically measure the process and patient outcomes. The creation of the “G-60” geriatric trauma service was established. With “G-60,” the care of our elderly trauma patients was led by the trauma surgeon and handled through a multidisciplinary approach that included collaboration with other specialist and ancillary services. This required
buy-in from all collaborators. G-60 patient inclusion criteria were as follows: (1) age equal to or greater than 60 years, (2) traumatic injury requiring hospital admission, (3) injury occurred within the previous 48 hours. When the above criteria were met, the G-60 team was activated.

The goals of our service were (1) 30 minutes from emergency department (ED) presentation to trauma service evaluation, (2) 4 hours from ED presentation to inpatient room, (3) 36 hours from ED presentation to operating room evaluation, (2) 4 hours from ED presentation to inpatient emergency department (ED) presentation to trauma service, (3) injury occurred within the previous 48 hours. When the above criteria were met, the G-60 team was activated.

We then published the creation of the geriatric trauma unit, which we now referred to as a “service.”

As often observed with good clinicians endowed with critical reasoning, and procedural skills, we proceeded to examine the effect of our G-60 program on patient outcomes. We compared outcomes measured 1 year before G-60 and 1 year after the program was implemented. Our outcomes revealed decrease in ED LOS [length of stay], ED to OR times, decrease SICU [surgical intensive care unit] days, and HLOS [hospital LOS]. We also found a decrease in morbidity. These findings were published in 2012. The results have been well received by our peers. I have implemented the G-60 service since moving to John C. Lincoln Hospitals in Phoenix, Arizona, and we are seeing similar results.

The American College of Surgeons Committee on Trauma has recently established the Trauma Quality Improvement Program (TQIP). This program provides risk-adjusted benchmarking, data collection, and identification of structural processes to improve care. The TQIP Geriatric Trauma Management Guidelines is a landmark document that describes protocols and practices to improve trauma care among geriatric patients.

New “G-60” innovations

As a result of prior success of our geriatric trauma program, we have since implemented new and exciting ways to improve the care we provide to our G-60 patients. We embarked on 3 initiatives. Two of these include the application of intercostal rib blocks and femoral nerve block or continuous peripheral nerve block for rib and hip fractures, respectively, among G-60 cohorts. The introduction of these new procedures appeals to surgeons in the field.

The 3rd initiative involves the use of a Vulnerable Elder Survey (VES-13) score as a predictive tool for identifying G-60 patients who are at increased risk for adverse trauma outcomes. The VES-13 is a scoring system that considers factors such as a patient’s age and assesses self-reported health, physical functional, and functional disability.

We asked and sought answers to several questions: (1) Is VES-13 an appropriate tool for use among G-60 population? (2) What is the strength of the relationship between VES-13 score and age in G-60 trauma patients before and after correction for age? (3) Does preinjury VES-13 score (0–10 points, higher = greater risk) predict outcomes such as LOS, complications, patient disposition, or death?

We observed that after adjusting for age in the composite score, 25% of the variation in VES score was explained by age. Our results also showed that preinjury VES score was predictive of discharge disposition home versus elsewhere, whereas Injury Severity Score did not. We plan to continue the use of VES during long-term follow-up studies in multidisciplinary settings.

The implications for surgical history

Over the years, I’ve come to realize that I am a leader in the field of general surgery and, more specifically, acute care surgery. This is not because I have done momentous things but because the things I have done are being put down in the history books as confirmation of discoveries and experiences in surgery. This defines and expands the field in which we work. I want to share with you my own personal journey in history making. I do so not in order to dwell on or celebrate what I have done, but rather to inspire us all to celebrate what others can and must do as we move toward the future. I do it to celebrate and encourage the history makers yet to come.

The journey/wings to fly

Many in this audience were trained in an era in which we were required to do research. I myself was required to do a year of research at the end of my 2nd year of general surgery residency, in 1996. Research was not something I wanted to do. I was simply fulfilling a requirement. I can clearly remember spending days trying to figure out how I could talk my program director, Dr John Potts, into letting me out of the requirement. I had no interest in research at that time.

I mentioned my research requirements in a call to Dr David Satcher, the former president of Meharry Medical College, where I attended medical school. Dr Satcher had moved on to the CDC, where he was serving as director. He kindly invited me to serve my research year at the CDC under Dr William Jarvis. There I worked as a temporary Epidemiology Investigative Service officer.

Under Dr Jarvis, I participated in outbreak investigations. My first such investigation involved patients who developed peritonitis following peritoneal dialysis. The work actually turned out to be a lot of fun and a very rewarding experience. This investigation resulted in my first publication and first contribution to the medical literature.

The original resident research requirement was for me to do a year of research, but I was asked by the CDC to take on a bigger project, which required an additional year beyond that—I, the resident who did not want to do research, asked for an additional year off to do research? That additional year, however, allowed me to make one of my biggest contributions to surgical history: the CDC guidelines for the
prevention of surgical site infection,13 published in 1999. This landmark work has since been cited positively in the medical and scientific literature more than 3,300 times.

This contribution to medical history continues to impact current surgical practice across the country and beyond every day of the year, all due to a “requirement” that I would have gotten myself out of if I could. Looking back now, I can appreciate that. At the time, though, I did not. I was a young resident excited about returning to the operating room and could not see the forest for the trees.

I returned to my residency program at the University of Texas in Houston, where Dr Fred Moore was the new director of trauma and critical care. This man was an incredible historian. Dr Moore was a man of immense vision for surgical research and thus surgical history. Importantly, he is someone who, in both conscious and unconscious ways, breeds true: a predecessor of other history makers. He transmitted that vision to me, as he has done too many others. His influence played a tremendous role in my life and my career development.

Like the majority of attending physicians, Dr Moore was a very good mentor in the OR and ICU. But he is unique in the way he allows the young mind to “explore” without unproductive criticism, if any criticism at all.

Surgical attendings are always busy people, but if a resident said “I have this idea…” or “I have a crazy thought about…,” he’d stop what he was doing and listen. Comments like that would grab his attention. Others might have considered these “wandering thoughts” a distraction. He knew they could lead to great things when the ideas are explored systematically. He was careful to not waste ideas of his students/residents.

For example, during my chief year, I was on call one evening when a patient presented with multiple rib fractures and associated hemothorax/pneumothorax. We placed a chest tube, but the patient continued to bleed 75 to 100 cc an hour from the chest tube over the next 6 hours. I deliberated over the output, as the patient did not meet the standard criteria for operative thoracotomy, which is 250 cc every hour for 2 to 3 hours. My gut feeling was that we should operate to find out what was causing this abnormal bleeding. I went with my intuition, made the decision, took the patient to the OR, and found that he was oozing blood from the right ventricle, where a piece of rib had punctured his heart. The shard bone was still in the ventricle.

It seemed to me that other surgeons might encounter a similar case and toil over a patient with the same kind of bleeding issue. I thought it would be a great case report. Some said it’s just 1 small case, hardly worth mention in a medical journal. Dr Moore said no, it was absolutely important. He assured me that someone in the field had either had such a case or would face such a case in the future. He believed that my observation and experience would be important to the history and future of surgery.

Not only did we write it up, but Dr Moore took me to my first national meeting of the Western Trauma Association, where I was able to present this case. I saw firsthand the enthusiasm from the audience as assessed by the number of questions I was asked. I also had the privilege to meet many esteemed and influential colleagues. I published the case report.14

I left that meeting in awe—inspired and already thinking about another case report or what I could study next and come back to present the next year.

The next step in my journey was working alongside Dr Scott Norwood, the trauma director at East Texas Medical Center (ETMC), while I was doing a trauma fellowship. Dr Norwood had originated at ETMC what he called “family rounds.” Once a day, at 10:45 AM, all family members of any ICU trauma patient could meet with the trauma surgeon, to get direct answers to whatever questions they might have about their loved one’s condition or plan of treatment from the trauma team.

After participating in this daily ritual for about 3 months, I began to realize that the process was very valuable, not just to the family but to the trauma surgeon as well. The opportunity to meet with the families once a day freed up significant time for the trauma surgeon. And the families loved it. They felt included in the care and respected by the clinical team. Family perceptions became an important part of the clinical overview as well. This opened my eyes to look beyond the operating room to the human drama in front of me. I began to see each individual case as a participation in the lives of people, not just as a clinical operation.

The incorporation of families into daily rounds has now become the norm across the country. However, at the time, it was not commonplace and its value unproven. I told Dr Norwood that I wanted to do a formal study of family rounds to see whether they really were as valuable as I had begun to believe.

Dr Norwood had been doing family rounds routinely for more than 5 years, and his initial answer could have been that there was nothing that important to be gained from such research. Instead, he welcomed my curiosity and encouraged me to go forward. Because he did, I was able to make another contribution to the surgical history books and able again to present at a national meeting.15

Alicia Mangram, the surgical resident with “no interest in research,” was initiating research of her own and adding to surgical history. Every time I made a contribution, it increased my excitement about the process. I began to think beyond the day’s cases. I began to think in terms of adding to and expanding surgical knowledge. I was looking ahead to meetings, excited about the opportunity I’d have to share with colleagues, to put my ideas out there. I was anxious for the feedback, critique and encouragement these meetings provided.

Resident research education

The residents we are now training are from generation Y or the millennial generation. There are no precise dates for this generation, but they were born between the late 1970s
or early 1980s up to the year 2000. These residents are well educated, skilled, clearly comfortable with technology, and very self-confident. I refer to them as the “all-knowing” younger generation, as they think they know it all. All residents, even this new millennial group, are very much the same in certain ways: they are eager to get out there and perform; they think they know everything, and they really don’t know what’s good for them. The good news is that if handled well, they are teachable and moldable.

Unfortunately, many residents are no longer required to do research. This is something I challenge. One thing I hear over and over in every organization is the concern over how we increase our inflow of young resident/fellows and attending membership. How do we get them interested and enthusiastic about participation in our societies? How do we encourage them to attend meetings?

I submit to you that the answer may lie in how we encourage and mentor these young people. It may lie in our resident research education. I have had the pleasure and privilege of training many residents over the years: young men and women with great potential for the future of surgery. I have also found that, like many of my own generation, the majority of these young millennial generation residents do not care about research. Like me at their stage of training, they lack the ability to grasp the importance and the joy of making discoveries and sharing them with colleagues the way we do at meetings like ours. They only want to operate.

**It begins with how we educate them**

My generation of residents spent a year or even 2 in the lab because it was a requirement as part of their residency training. Because of that requirement, many found that they actually enjoyed the research, and many were encouraged and put forward by their attendings the way I was. These young residents have so many ideas, but they are worried that we will think their ideas are crazy or that we will shoot them down. Consequently, they often stay silent when they should speak up. How we react to their ideas and how we walk alongside them and encourage them to participate in history making and presenting can make all the difference.

After my time with Dr Norwood, I came to work at Dallas Methodist Medical Center, a community training program, under the leadership of Dr Ernest Dunn. Here the surgical residency program did not require a research year, which was a plus in the opinion of many of the residents. Dr Dunn, however, is a true researcher, who had done significant work in the laboratory. He also had a unique ability to identify those who wanted to do research and he encouraged them. Thanks to his leadership, a lot of research got done even without the requirement, unfortunately only by those residents who already expressed interest, however.

Dr Dunn appointed me assistant program director and gave me a green light regarding the teaching of residents, allowing and encouraging me to teach them my way. And by this time, my way was to listen for the “wandering thoughts” and to encourage the residents to think outside the box. One example is the story of a time when I was performing a difficult laparoscopic cholecystectomy with a 2nd-year resident. In this particular case, everything was inflamed, purulent fluid gallbladder, distended with ischemic changes. We couldn’t identify the anatomy, so I converted to an open cholecystectomy. I made a decision to leave the triangle of Calot alone, as this area was too inflamed and I didn’t want to risk a CBD [common bile duct] injury. I came across the gallbladder, leaving a stump, or partial cholecystectomy. My “all-knowing” resident informed me that I couldn’t do that. He said we couldn’t leave part of the gallbladder behind. I said yes we can, and we will. I told the resident that day, “Why don’t you review all of our partial or stump cholecystectomies?” He did, and this resulted in his first publication and first presentation at a national meeting.

Another example is the time I was once told by another resident, who of course “knew” everything, that doing multidisciplinary rounds in our ICU would not make any difference, because it is “an open unit.” This resident, like all my residents, had no research interest then. That experience resulted in his first abstract and publication. Since that time he has presented on different topics at 3 national meetings. Over the last 9 years, I have witnessed over 40 such examples, all resulting in a paper, abstract, case report, or presentation.

As program directors, we’ve all had that resident or 2 that we can pick out as our researchers, that M.D.-Ph.D. student. The reality is, however, that most young surgical residents today don’t want anything to do with research and likely could also care less about coming to a meeting filled with research presentations. But every day, we have an opportunity to mold them towards putting their findings down in the history books, benefiting from the collegial response, critique, and encouragement of sharing their work at meetings like this.

**Tying it all together**

Our G-60 populations are not the traditional trauma patients we’ve been accustomed to caring for over the last 20 years. Right now, we are adapting and coming up with new and innovative ways to care for these elderly trauma patients. We are providing better medical care because of that.

At the same time, residency training is also not the traditional training we remember 10 to 20 years ago. In my opinion, it is just as important for us to create new innovative ways to train residents. If we are going to continue to grow our surgical history and thus our national organizations, we must think outside the box. I suggest that we require scholarly activity during the 5-year program and...
all residents be required to attend a national meeting during their training. Just as we require them to perform a minimal number of pancreatic resections, we should require a minimal number of scholarly activities. Every program has the ability to mandate this with or without a designated year off for research.

It is unrealistic to expect a young surgeon who has never written a paper or asked to attend or be involved in a national organization to suddenly develop an enthusiasm for the experience after they finish their training. Our numbers tell us it is not happening. Our lack of vision in this area will, I believe, lead to continued decline in membership and participation.

In conclusion, the defining issue is not whether G-60 is coming; G-60 is already here. Similarly, it is not whether resident research is needed, but rather, Can we excel without resident research? We also need to understand that best practices are scientific research based, which equals the need for scholarly activities. In turn, our future success also equals best practices.

Moving forward, we need mandatory scholarly activity with or without designated years off from research, remembering that best practices derived from research is imperative. I will leave you with this final thought. “In order to see where we are going, we not only must remember where we have been, but we must understand where we have been as well.”

References